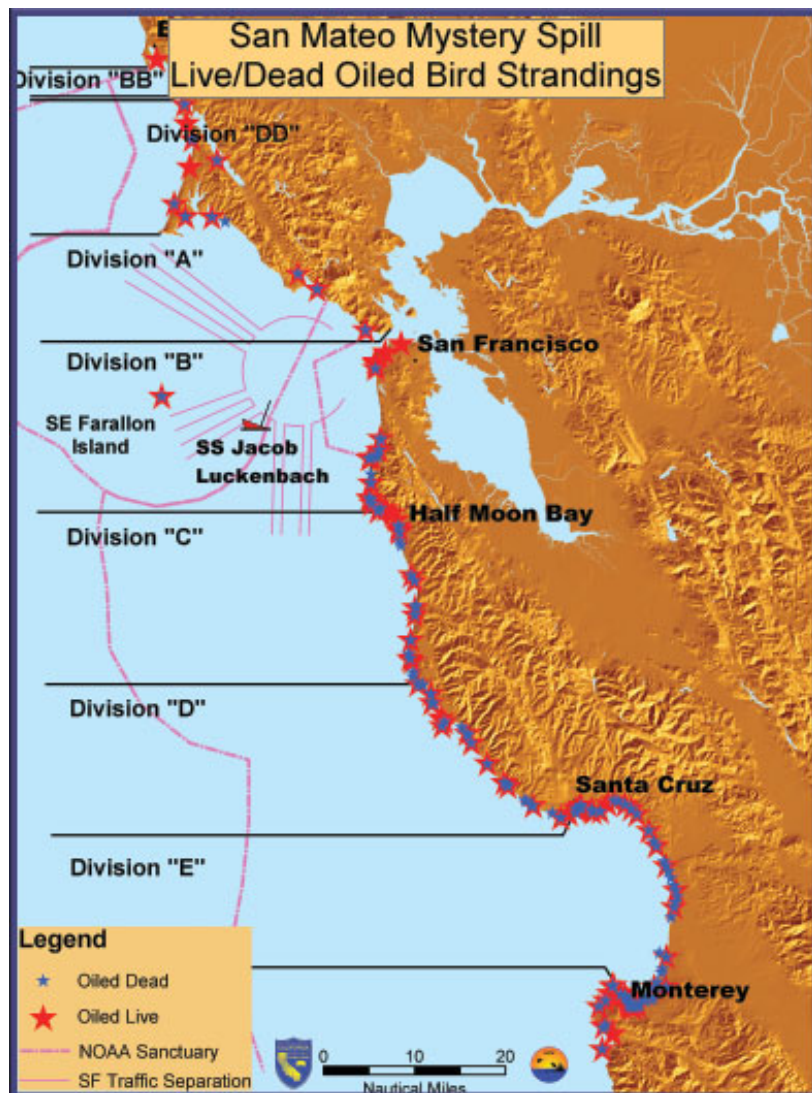


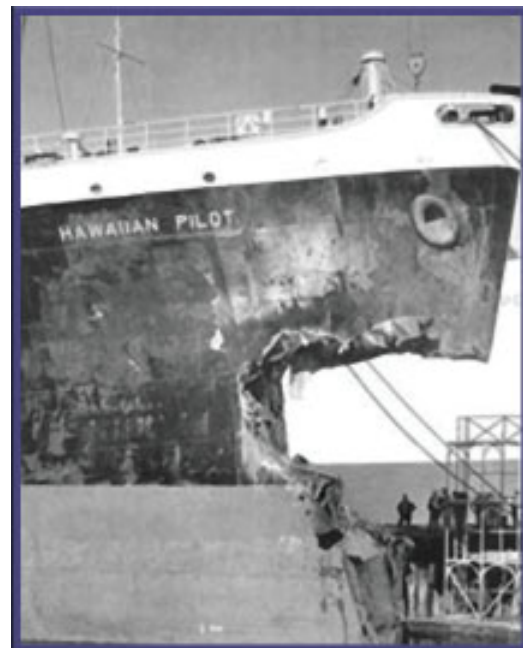
Ghost of the SS Jacob Luckenbach



Above, historic photo of Luckenbach. Below, locations where birds came ashore.



Map by OSPR Geographic Information System Team



The Hawaiian Pilot after the collision.



Photo by Dan Porter

Distribution and numbers of oiled birds collected early in the mystery oil spill. The coastline was divided into operational divisions to direct wildlife rescue and collection teams.

Thousands of Common murre were killed over the years by leaking oil from the wreck of the Jacob Luckenbach.

ch: The hunt for clues to a killer



DFG file photos

Common murre coated with oil.



Oil tarball from the Luckenbach.

In the early morning darkness and fog on July 14, 1953, the freighter *SS JACOB LUCKENBACH*, loaded and out-bound for Korea, was struck near the stern by the *SS HAWAIIAN PILOT*. It sank

By Kim McCleneghan

30 minutes later about 17 miles southwest of the Golden Gate Bridge, at the entrance to San Francisco Bay. Although the event soon faded into history, a legacy of mystery oil spills began that likely injured or killed untold thousands of seabirds over nearly 50 years. Following is the story of how a group of scientists and staff of various disciplines from state and federal government agencies worked cooperatively in an intensive investigation to discover clues that eventually led the team to identify the *SS JACOB LUCKENBACH* as the source of the mystery oil.

Oil spills with no known source have repeatedly occurred off the central

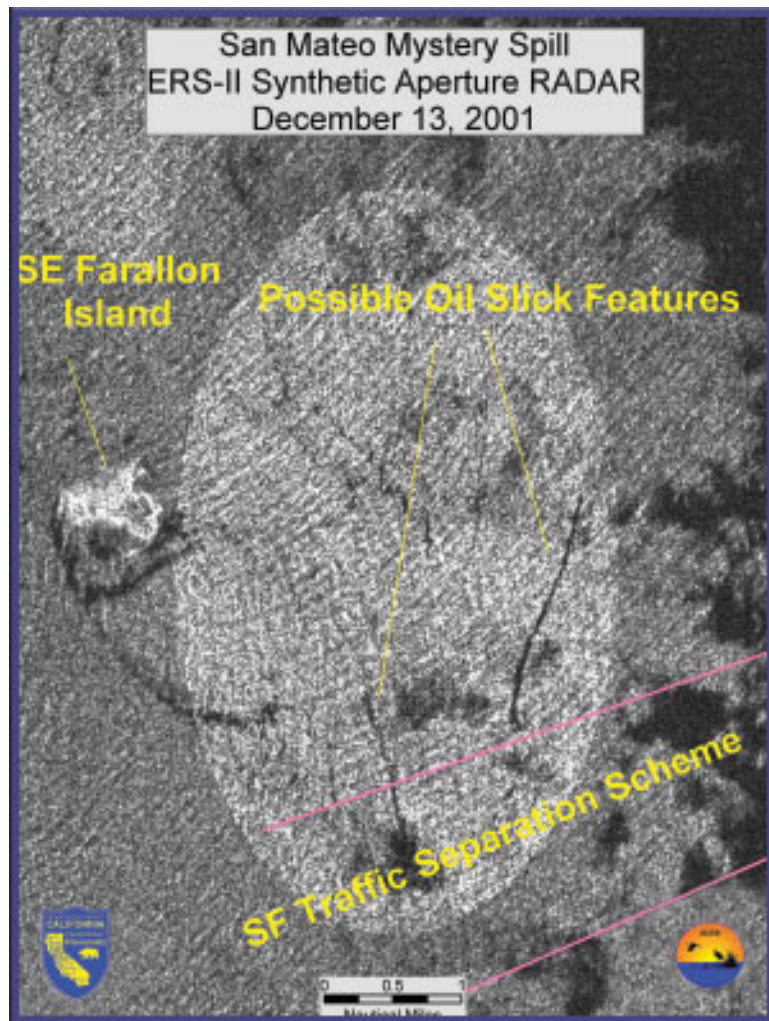
California coast during late fall and winter months since at least the mid-1970s. These “winter mystery spills,” as they came to be known, shared several similarities; they occurred during significant coastal storms, little oil was ever collected on shore or was seen from spotter aircraft, oiled birds would strand along 100 or more miles of the central California coast, and common murres were the most numerous among the different species of oiled marine birds recovered from beaches.

On Nov. 23, 2001, oiled birds, predominantly common murres, were once again discovered on central California beaches. Although no oil spill had been reported and there were no oiled beaches to be cleaned, the California Department of Fish and Game Office of Spill Prevention and Response (OSPR) and the U.S. Coast Guard, Marine Safety Office, San Francisco (USCG), established a Unified Command in order to manage the rapidly

escalating event. The OSPR initially assumed lead-agency role since the response effort primarily involved the search, collection, and transport of oiled birds to the Oiled Wildlife Care Network for cleaning and rehabilitation. It soon became apparent to the Unified Command that this event was different in several respects. Oiled birds continued to be found almost daily during December 2001 and January 2002, a much longer time than usual for most oil spills. Also, oil collected from these birds continued to have a “fresh” consistency, not “weathered” and tar-like. Moreover, hundreds of oiled birds—again, predominantly common murres—were recovered from beaches along a broad expanse of coast, from Pt. Lobos south of Monterey to the mouth of the Russian River north of Tomales Bay, a distance of over 220 miles.

Due to the number of birds affected and the duration and extent of coastline involved, and

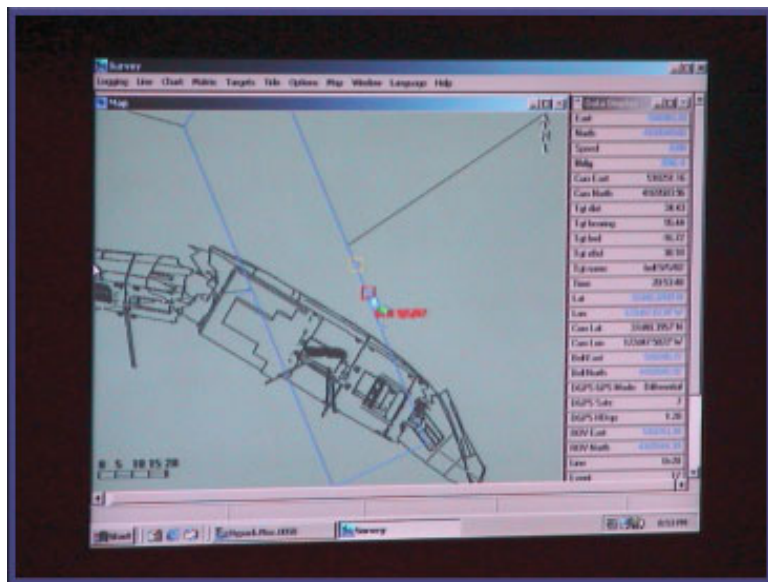
because birds continued to encounter fresh oil, the Unified Command organized the Oil Source Identification Task Force to find the source of the mystery oil. This Task Force consisted of the following units: Oil Chemistry, Remote Sensing, Air Operations, Tankers and Shipping, Trajectory Analysis (for both oil and oiled birds), Sunken Vessels, and Geographic Information Systems and Data Management. The Task Force was comprised of scientists and staff from OSPR, USCG MSO San Francisco, California State Lands Commission, National Oceanic and Atmospheric Administration, California Oiled Wildlife Care Network, Gulf of the Farallones National Marine Sanctuary, U.S. Fish and Wildlife Service, the oil industry, and private consultants all working at the direction of the Planning Branch within the Unified Command. The investigations and research of each unit in the Task Force proceeded concurrently. The Task Force met weekly during



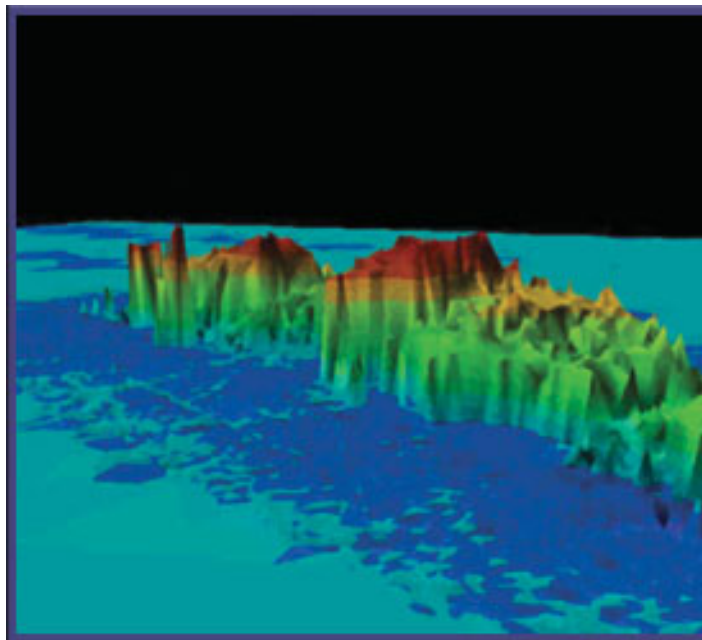
Map prepared by OSPR Geographic Information System Team



A bad oil leak which the divers in saturation could not control required a surface diver go down to deal with it. Dive team did not want to get the saturation divers' gear oiled. Oil in a saturation system can lead to fire (like the Apollo disaster) and cause pneumonia in the divers. Divers in saturation cannot go to the surface. They must decompress in the saturation system which takes nearly 3 days.



DFG photo by Debra Hamilton



During the initial search for sunken vessels, side scanning sonar generated images of a wreck on the bottom.



Photo by Craig Moffatt



DFG file photo

Transfer between barge and tug boat.



DFG photo by Debra Hamilton

January-February 2002 to share rapidly developing information, discuss ideas for continuing investigations, and delegate assignments. This consortium of scientific disciplines and staff expertise, sharing information under the Unified Command structure, was key to the successful outcome of this effort.

The real work-horses throughout the event were the chemists at the OSPR Petroleum Chemistry Laboratory (PCL) and the USCG Marine Safety Laboratory (MSL). They provided several crucial pieces of information which eventually led to solving the mystery. Hundreds of oil samples collected from birds, as well as tarballs collected on the water and on beaches, were rapidly analyzed and promptly reported to the Unified Command continuously over the months-long spill event.

Overflights conducted almost daily by either the USCG or CDFG to search for oil on the vast area of ocean from Pt. Reyes north of San

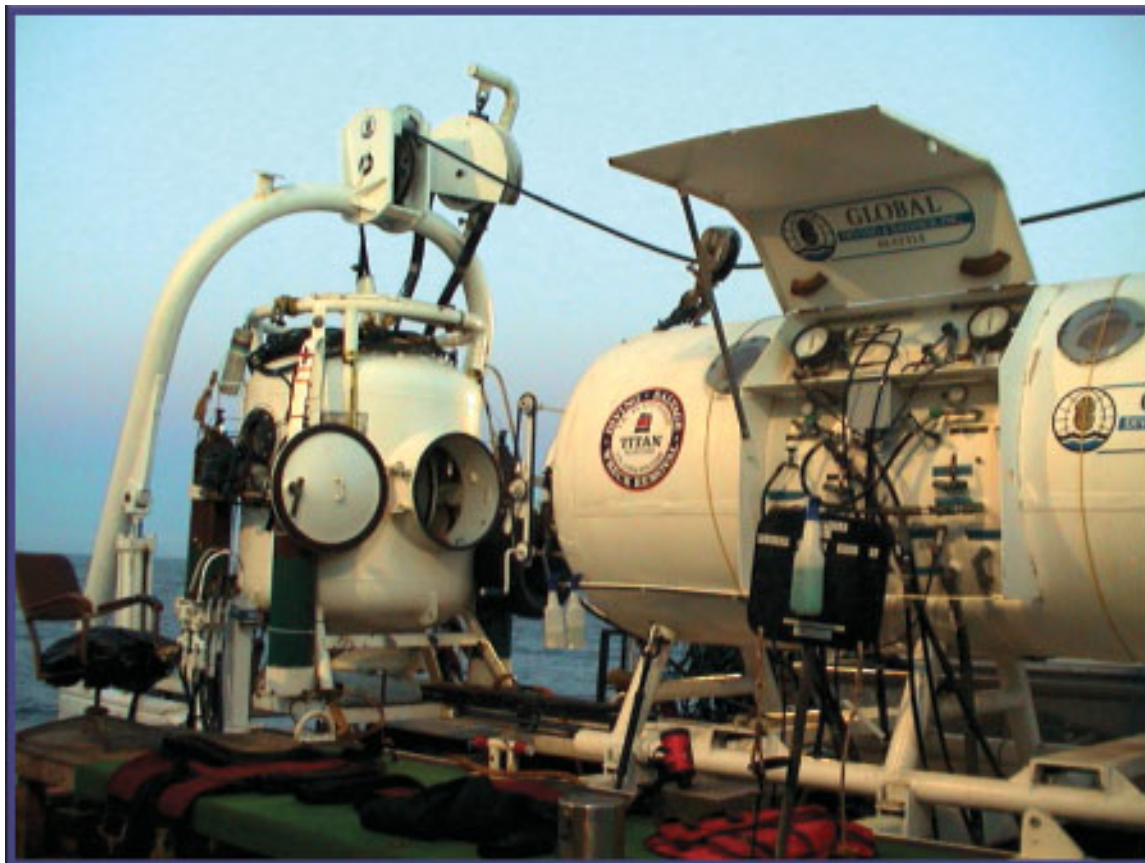
Francisco Bay to Monterey Bay on the south, were often fruitless. No oil slicks were ever seen, but observers would occasionally spot what appeared to be narrow ribbons of oil sheen several miles long. Generally, these sheens were from five to 20 miles offshore southwest of the Golden Gate and proceeding southeast towards shore. On one occasion a USCG patrol boat was able to get to the site and collect a few small tarballs from the water.

Chemists at PCL and MSL compared analytical results of oil from birds, oil collected by the USCG vessel, and tarballs collected on one beach. These oil samples matched one another confirming they had come from the same source. In addition, the PCL chemists believed the oil was either a weathered crude or a heavy fuel oil. Furthermore, they determined the mystery oil was not Alaska North Slope crude nor was it from any known natural marine oil seep off California.

In keeping with the OSPR

legislative mandate to use "best achievable technology" during oil spill response, the OSPR Administrator approved a request from OSPR staff in the Remote Sensing Unit to employ satellite imagery in order to look for oil slick "signatures" on the ocean. Synthetic Aperture Radar (SAR) images from the European Space Agency ERS-2 satellite and from the Canadian Space Agency RADARSAT-1 satellite were selected based on satellite position, oceanic conditions conducive to seeing oil, and oiled bird recovery peaks. Five SAR images were purchased by OSPR. One of the ERS-2 images clearly revealed a number of features consistent with long windrows of oil in an area about 20 miles southwest of the Golden Gate, near Southeast Farallon Island, the same general location where air observers had also occasionally seen oil sheen streaks.

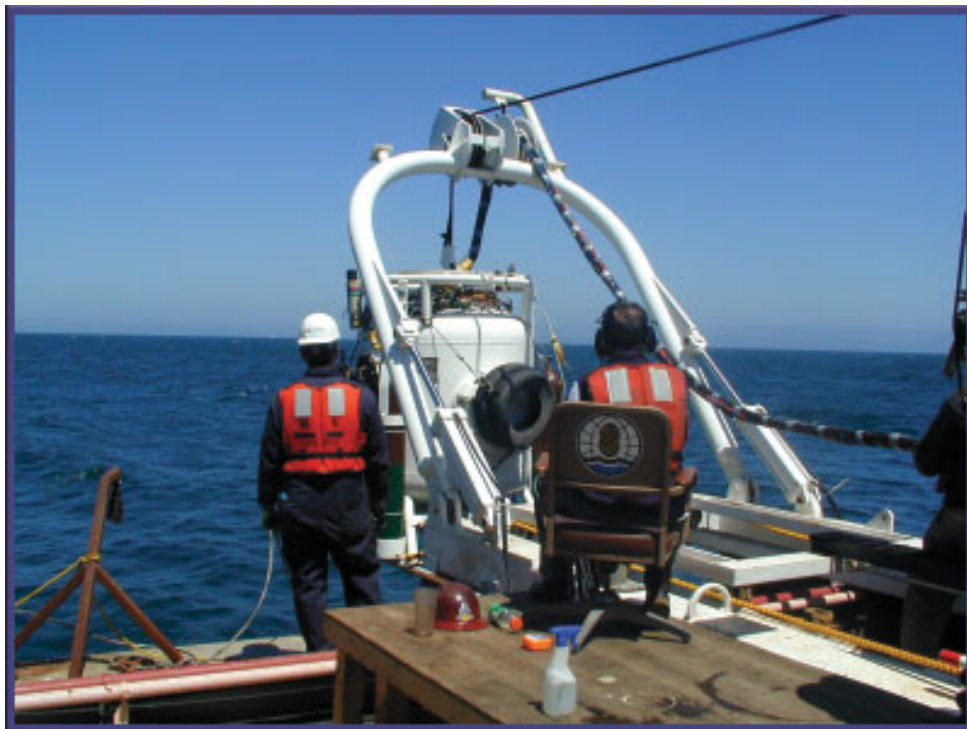
An unreported discharge from a vessel was considered a possible source of the mystery oil. Samples of fuel



The diving bell (left) transfers divers from the habitat(right) to the wreck. Divers remain in the habitat under pressure equal to a depth of 140-170 feet for a period of 30 days. Called saturation diving, it takes 2 to 2.5 days to decompress.



Diver safety is critical. The equipment is checked regularly to ensure the divers' safety. Compressed gases maintain the pressure in the habitat and dive bell.



Two divers are lowered in the bell to the wreck. First they explore the wreck and identify landmarks from plans presented by engineers. Once the landmarks are located, divers triangulate to locate the section where engineers believe the tanks holding fuel oil would be. Divers then drill holes through the hull and insert a rod to see if oil is there. They then seal the hole with a bolt and gasket, continuing in this manner down the vessel until they locate only water. This allows specialists to calculate the amount of oil in the tank, and begin preparations to remove it.



Photo by Craig Moffatt

Oil from wreck is pumped aboard the support barge.



DFG photo by Debra Hamilton

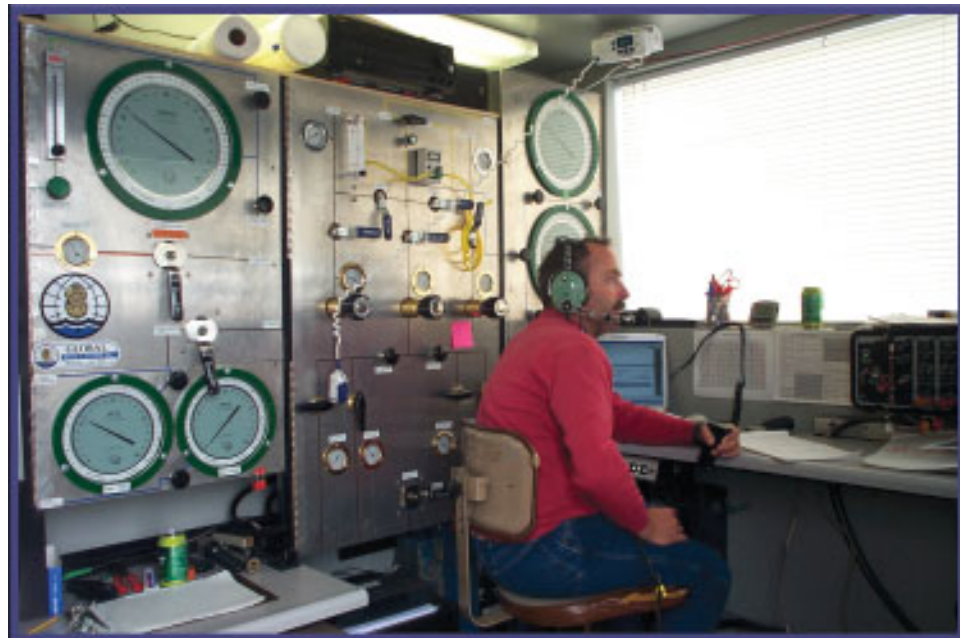


Photo by Kim McCleneghan

Dive Master oversees divers while working on the wreck; divers supply of mixed breathing gases and the environment of the dive system is monitored 24 hrs a day.

and oil cargo from ships that had recently entered San Francisco Bay or had transited the area were analyzed and compared with the mystery oil, but none matched.

Meanwhile, the PCL chemists gathered archived oiled feather samples from a decade of previous winter mystery spills. The Task Force scientists seemed momentarily stunned when PCL reported the mystery oil from the current spill matched the oiled feather samples taken from birds during winter mystery spills in 2001, 1999, 1997-98, and 1992-93. This clue was pivotal. The Task Force had now pretty much ruled out recent shipping and natural oil seeps, and as there are no oil wells or oil pipelines off the central California coast, the only remaining possibility seemed the most plausible. It was likely the mystery oil was coming from a sunken ship. However, there are some 1,500 sunken vessels along the California coast with about 700 of these off central California. The Task Force

focused its attention on both the information contained in several sources on sunken vessels and on the information regarding oiled birds recovered during each of the mystery spills over the last decade.

Oiled birds collected during the decade of winter mystery spills came from the same stretch of coastline. Furthermore, common murres were the most numerous among those marine bird species oiled, sometimes comprising 90 percent of the birds recovered. Ornithologists working with the Task Force were able to provide important information in the search for the source of the mystery oil based on an understanding of the natural history and behavior of the common murre.

From November through February, common murres concentrate near the Farallon Islands. The birds forage in a large area of ocean surrounding these islands prior to congregating by the tens-of-thousands on the islands to nest and rear their

young in spring and early summer. While birds occur throughout the Gulf of the Farallones during winter months, common murres are most abundant southeast of the Farallon Islands, that same area where air observers saw oil, where the satellite image (in which the Southeast Farallon Island can clearly be seen) showed oil, and where the USCG patrol boat collected an oil sample. This helped explain why the common murre is the species most often oiled; the birds are most abundant in that area of ocean where the mystery oil is most often found.

The bird experts also re-examined the location collection data for birds recovered during the 1997-98 winter mystery spill. The objective was to use individual bird collection data and what is known about oiled bird stranding behavior in conjunction with wind data at the time of the event. The result of this analysis is a line from a point where the bird is assumed to have contacted oil to the spot

where it was discovered on a beach. Performing this "hind-cast" analysis for a large number of birds yields a graphic with lines converging on an area of ocean. This hind-cast graphic can be interpreted to display the area where the birds most likely encountered the oil. In this case, one of the probable locations identified was again that area of ocean 20 miles southwest of the Golden Gate, very near the Farallon Islands.

The Sunken Vessel Unit of the Unified Command reviewed four databases containing records on over 700 sunken vessels. Of these, the Task Force presented to the Unified Command four candidate vessels located in the vicinity of the Farallon Islands which might be the source of the mystery oil.

A leading suspect was the sunken stern of the chemical tanker *T/V PUERTO RICAN* which exploded and sank in about 1,500 feet of water south of the Farallon Islands in 1984 causing a large oil spill at the time. Also, the wreck continued to leak oil



Oil tanker heading out under the Golden Gate Bridge.

DFG photos by Debra Hamilton



Kim McCleneghan onboard during oil salvage operation. McCleneghan was the state planning chief. DFG initiated the response around Thanksgiving 2001 because of the large number of oiled marine birds washing ashore. Freshly oiled birds continued to come ashore for the next several months. DFG and the U.S. Coast Guard decided the mystery had to be solved.



Common murre released after being rehabilitated. The Office of Spill Prevention and Response has a Mobile Veterinary Laboratory that teams with its Oiled Wildlife Care Network. Veterinarians and highly trained volunteers collect the oiled birds which are triaged and transferred to a facility where they receive special treatment. The goal is to restore them to health and strength and then release them.



How to make a difference

Solving the mystery of the Luckenbach spills required the expert sleuthing and talents of several federal, state and local governments. But oil spills from large ocean vessels are just one source of pollution for California's coastal waters.

Recreational boaters and urban runoff contribute significantly to the degradation of the ocean. The Department of Fish and Game and its Office of Spill Prevention and Response continue their vigilance in safeguarding these waters, but they need your help. For more information about how YOU can make a difference,

Call (916) 653-6420; write the Department of Fish and Game at 1416 9th Street, Room 117, Sacramento CA 95814; or email cprusins@dfg.ca.gov and ask for the "It Only Takes a Little Bit" brochure.

for several months after it sank. The PCL chemists had earlier compared their archived sample of the ship's fuel with the mystery oil but these did not match.

However, there was other oil and non-oil cargo in tanks that sank with the stern for which there were no samples. Chevron Corporation, owner of the ship's cargo, provided samples of those products but none matched the mystery oil. The *T/V PUERTO RICAN* was removed from the suspect list.

Another possible source of the mystery oil was the World War II aircraft carrier *USS INDEPENDENCE* which lay approximately 15 nautical miles southwest of the Farallon Islands at a depth of about 3,200 feet. It was sunk by the U.S. Navy in 1951 after it was contaminated by radiation during its use in nuclear bomb testing at Bikini Atoll. It is unknown if any fuel oil remains aboard this ship.

The databases also contained information about several barges that sank in the vicinity of the Farallon Islands during the 1940s. Two of these are referred to as YTB U.S. Navy Oilers located two

miles northeast of Southeast Farallon Island. There is information regarding another barge lost under tow and presumed sunk, but its location is unknown.


However, the records regarding these vessels are sketchy and confusing. Local recreational divers reported their observations of two old barges near the Farallon Islands to the Unified Command. Based on their reports regarding the vessel conditions, the barges were presumed to be unlikely sources of the mystery oil.

The *SS JACOB LUCKENBACH* was a C-3 freighter built in 1944 with a capability to carry 457,000 gallons of ship's fuel. When it sank on July 14, 1953, after a collision with the *SS HAWAIIAN PILOT*, it was outbound from San Francisco en route to South Korea with a load of railroad, automotive, and other materials for the war. It sank in about 175 feet of water 17 miles southwest of the Golden Gate Bridge, about 10 miles southeast of the Southeast Farallon Island. This general area is near the location where air observers had seen sheen, where the USCG patrol boat had

collected a few small tarballs, where the ERS-2 satellite image captured oil windrows, and where the common murre hind-cast analysis indicated the birds had most likely encountered the oil. Also, two recreational divers who had read newspaper accounts of the search for the mystery oil, dove on the wreck. An oil sample they collected on the surface above the wreck was analyzed by PCL and MSL and found to match the mystery oil. Many pieces of the information puzzle were converging on the site where the *SS JACOB LUCKENBACH* sank. Because of these facts, the Unified Command decided to investigate this wreck first.

The Unified Command employed a local commercial dive company to conduct a survey of the wreck of the *SS JACOB LUCKENBACH* using a Remotely-Operated Vehicle (ROV). During this operation, personnel on-scene observed oil rising to the surface. In addition, the ROV not only obtained video of tarballs drifting around inside the hull, but also returned to the surface with oil on the vehicle and its tether. Analysis of this oil matched

the mystery oil.

The source of the mystery oil that had killed thousands of marine birds, some of them endangered species, over at least a decade, had been discovered. But the adventure was not yet over. Without pausing to celebrate their success, the Unified Command set about to contract for removal of fuel oil from the wreck of *SS JACOB LUCKENBACH* in order to eliminate the substantial, intermittent release of oil that likely began when the vessel sank. Over the ensuing months, the Unified Command and their contractors eventually pumped over 100,000 gallons of bunker fuel from the broken, crumbling wreck in a precedent-setting, innovative, successful effort to remove oil that for decades caused significant injury to wildlife and the marine environment off central California. 

Kim McCleneghan, Ph.D., is an oil spill response expert with DFG's Office of Spill Prevention and Response. He has been working on oil spills since 1969 when he got involved with the oil platform blowout off Santa Barbara. He also worked on the Exxon Valdez oil spill response 1989, and the American Trader oil spill off Huntington Beach in 1990.